



University/Academy: Arab Academy for Science and Technology & Maritime Transport

Faculty/Institute: College of Computing and Information Technology

Program: Information Systems

**Form No. (12)
Course Specification**

1- Course Data

Course Code: IS474	Course Title: Advanced Database Systems	Academic Year/Level: Year 4 / Semester 7
Specialization: IS	No. of Instructional Units: 2 hrs lecture 2 hrs lab	Lecture:

2- Course Aim	This course covers the advanced topics and some divergences in the database field. Advanced topics would include data warehousing, web databases, XML databases, and mobile databases. Some divergences of the database field that will be also covered include distributed databases. An important component of this course will be studying how to develop robust transactional database applications using Java's open-standard database connectivity - JDBC and the role of persistence frameworks & application servers with a persistence service in Database application development. Personal and team projects on databases and database application component development will be key components of the course using the open-source object-relational database system – MySQL.
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3- Intended Learning Outcome:

a- Knowledge and Understanding	Students will be able to demonstrate knowledge of: K14. The principles and techniques of database management systems, management, data mining, geographical information systems, multimedia, application development, business process management, enterprise systems, human-computer interaction, object-oriented analysis and design, e-technologies, multimedia, image processing, information and infrastructures security and computer graphics techniques. <ul style="list-style-type: none">• Review what is a database?• Review what is the database environment?• Review the relational data structure• Review the primary key and its integrity rule• Review the foreign key and its referential integrity rule• Review the relational database design (entity – attributes - relations) • Relate why we need to study web databases• Define web-related terms
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- Describe Internet-related languages
- List some web database applications
- Explain the requirements for the web-DBMS integration
- Explain the web DBMS Architecture (2-tier architecture)
- Explain the 3-tier architecture
- Explain the web-server functions
- Discuss the advantages and disadvantages of the web-DBMS approach

- Identify client-side and server-side scripting technologies
- Connect Web pages to databases
- Use CSS to apply formatting to Web pages
- Identify the benefits of Dynamic HTML (DHTML)

- Explain Object-Relational Mapping (ORM)
- Explain Java Persistence Architecture (JPA)
- Explain Rules for Mapping an Object Model to a Relational Database
- Explain Mapping Relationships
- Explain Inheritance Mapping for single and multiple tables
- Define the New universal data exchange format: XML

- Explain what is a data warehouse?
- Define the Data warehouse architecture
- Explain the Data warehousing sources of data
- Explain the Dimensional Model (DM)
- Explain the Cube Construction Models
- Define Dimension's Concept Hierarchy

- Define OLAP
- Discuss Why OLAP is needed?
- Explain the OLAP Operations
- Explain the Aggregation process
- Describe the Storage Modes: OLAP Servers
- Discuss Querying OLAP cube with SQL

- Explain what is Hadoop?
- Explain the design principles for Hadoop
- Explain what does Hadoop do
- Describe the Hadoop Architecture

- Identify what is Hive
- Define the Hive components
- Discuss Hive usage at Facebook

- Define data mining
- Explain Why use data mining today?
- Explain The knowledge discovery process

- Discuss why data preprocessing
- Explain the steps of the data preprocessing
- Define data integration and transformation
- Define the data mining model

- Show the different types of classifiers

	<ul style="list-style-type: none"> • Introduce decision trees • Explain what is association rules • Describe Mobile database • Show why is a Mobile Database Needed? <p>Define the Mobile Database Architecture</p>
<p>b- Intellectual Skills</p>	<p><u>By the end of the course, the student acquires high skills and an ability to understand:</u></p> <p>I11. Perform comparisons between (algorithms, methods, techniques...etc).</p> <p>I16. Solve IS problems with pressing commercial, time, and industrial constraints.</p> <ul style="list-style-type: none"> • Demonstrate what is a database? • Demonstrate the relational data structure • Demonstrate the primary key and its integrity rule • Demonstrate the foreign key and its referential integrity rule • Demonstrate the relational database design (entity – attributes - relations) • Demonstrate Internet-related languages • Investigate some web database applications • Demonstrate the web-server functions • Demonstrate client-side and server-side scripting technologies • Demonstrate how to Connect Web pages to databases • Demonstrate the use of CSS to apply formatting to Web pages • Demonstrate the benefits of Dynamic HTML (DHTML) • Demonstrate Object-Relational Mapping (ORM) • Demonstrate Java Persistence Architecture (JPA) • Demonstrate Rules for Mapping an Object Model to a Relational Database • Demonstrate Mapping Relationships • Demonstrate Inheritance Mapping for single and multiple tables • Apply the New universal data exchange format: XML • Demonstrate the Dimensional Model (DM) • Demonstrate the Cube Construction Models • Demonstrate Dimension’s Concept Hierarchy • Apply on a case study the three schemas (star- snowflake - starflake) • Demonstrate the OLAP Operations • Demonstrate the Aggregation process • Demonstrate the Storage Modes: OLAP Servers • Demonstrate what does Hadoop do • Demonstrate the Hadoop Architecture • Demonstrate what is Hive • Demonstrate Hive usage at Facebook • Demonstrate Define data mining through case studies • Demonstrate The knowledge discovery process

	<ul style="list-style-type: none"> • Demonstrate the steps of the data preprocessing • Demonstrate data integration and transformation • Demonstrate the data mining model • Demonstrate the different types of classifiers • Demonstrate decision trees • Demonstrate what is association rules • Demonstrate Mobile database <p>Demonstrate the Mobile Database Architecture</p>
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<p>c- Professional Skills</p>	<p><u>By the end of the course the student will have the ability to:</u></p> <p>P10. Use quantitative analysis techniques appropriately and effectively.</p> <p>P14. Perform information acquisition and management, using the scientific literature and Web sources.</p> <ul style="list-style-type: none"> • Practice the primary key and its integrity rule • Practice the foreign key and its referential integrity rule • Practice the relational database design (entity – attributes - relations) • Practice the web-server functions • Practice the Database creation and Deployment using MYSQL • Practice how to create webpages using Dreamweaver v4 • Practice how to Connect Web pages to databases using PHP • Practice Object-Relational Mapping (ORM) • Practice the New universal data exchange format: XML • Practice data warehousing concepts on a case study the three schemas (star- snowflake - starflake) • Apply the data warehousing process on SQL Server • Practice the OLAP Operations • Apply Querying OLAP cube with SQL • Practice what does Hadoop do • Practice the usage of Hive on different applications • Practice WEKA • Practice data mining through case studies • Practice Classification through WEKA • Practice the different types of classifiers • Practice association rules • Practice Mobile database on a case study <p>Practice the creation and deployment of such database on a real application</p>
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d- General Skills	<p>Students will be able to:</p> <p>G1. Demonstrate the ability to make use of a range of learning resources and to manage one's own learning.</p> <p>G3. Show the use of information-retrieval.</p> <p>G7. Show the use of general computing facilities.</p> <p>G8. Demonstrate an appreciation of the need to continue professional development in recognition of the requirement for life-long learning.</p> <ul style="list-style-type: none"> • Enhance Oral Communication Skills. • Enhance Team Working skills • Enhance Skills of Description, formulation and analysis of Database problems • Enhance Computer Tools skills 										
4- Course Content	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 5%;">#</th> <th style="width: 95%;">CLO</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>Explain the concepts for modeling, designing, querying and managing large databases.</td> </tr> <tr> <td style="text-align: center;">2</td> <td>Experiment with the modeling and design of distributed databases, data warehousing, web databases, XML databases, and mobile databases.</td> </tr> </tbody> </table>	#	CLO	1	Explain the concepts for modeling, designing, querying and managing large databases.	2	Experiment with the modeling and design of distributed databases, data warehousing, web databases, XML databases, and mobile databases.				
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5- Teaching and Learning Methods	Lectures, labs, Mini group projects, Individual assignments.										
6- Teaching and Learning Methods for Students with Special Needs	<ul style="list-style-type: none"> • Students with special needs are requested to contact the college representative for special needs (currently Dr Hoda Mamdouh in room C504) • Consulting with lecturer during office hours. • Consulting with teaching assistant during office hours. • Private Sessions for redelivering the lecture contents. <p>For handicapped accessibility, please refer to program specification</p>										
7- Student Assessment:											
a- Procedures used:	Exams and Projects										
b- Schedule:	<p>Week 7 exam</p> <p>Week 12 exam</p> <p>Project through the semester</p> <p>Week 16Final exam</p>										
c- Weighing of Assessment:	<table style="width: 100%;"> <tbody> <tr> <td style="width: 70%;">7th Week Examination</td> <td style="text-align: right;">30 %</td> </tr> <tr> <td>12th Week Examination</td> <td style="text-align: right;">20 %</td> </tr> <tr> <td>Final-term Examination</td> <td style="text-align: right;">40 %</td> </tr> <tr> <td>Semester Work</td> <td style="text-align: right;">10 %</td> </tr> <tr> <td>Total</td> <td style="text-align: right;">100%</td> </tr> </tbody> </table>	7 th Week Examination	30 %	12 th Week Examination	20 %	Final-term Examination	40 %	Semester Work	10 %	Total	100%
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8- List of References:											
a- Course Notes	<p>http://DB1.groups.live.com/</p> <p>http://DBone.gmail.com/</p>										

b- Required Books (Textbooks)	Silberschatz, F. Korth, <i>Database System Concepts</i> , McGraw Hill 6ED
c- Recommended Books	<ol style="list-style-type: none"> 1. R. Elmasri and S. Navathe, <i>Fundamentals of Database systems</i>, Benjamin-Cummings, 3rd edition, 2000. 2. C. J. Date, <i>An introduction to database systems</i>, Addison Wesley, 7th edition, 1999. 3. ORACLE manuals. 4. R. Ramakrishnan, J. Gehrke, <i>Database Management Systems</i>, 3rd edition, McGraw-Hill, 2003.
d- Periodicals, Web Sites, ..., etc.	

Course Instructor:

Head of Department:

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